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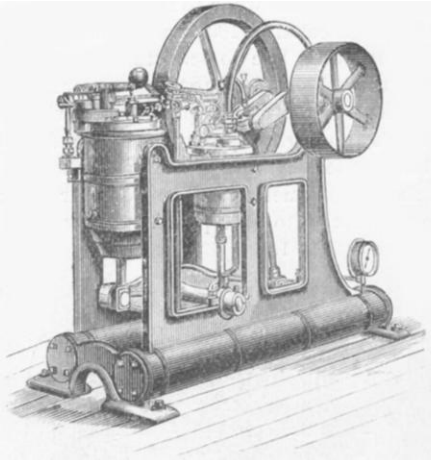

FIG. 2.—BRAYTON'S PETROLEUM MOTOR.

This remarkable and admirable engine acts like an instrument of precision. It can be started with a match and comes to its regular speed in less than a minute; it preserves its rate entirely unchanged for hours together. Moreover, it is economical, cleanly, and not more noisy than a steam engine. The one of two horse power I have, ran for six months, day and night, supplying water and air to the aquaria in the Centennial Exhibition at Philadelphia. At any time on going into the laboratory it can be started in a few seconds even though it has not been running for days.

Henry Draper's Observatory,
Hastings-on-Hudson, New York.

Note on the Exactitude of the French Normal Fork; a Reply to the paper of Mr. A. J. Ellis; by RUDOLPH KÖNIG, Ph. D.

(*Communicated by Professor Barker to the American Philosophical Society, July* 20, 1877.)

An attack, as strange as it was unexpected, has just been made in England upon the exactitude of the official French fork. Mr. Alexander J. Ellis, having found that the notes of a tonometer, composed of sixty-five harmonium reeds, constructed by Mr. Appunn, do not agree with this fork, has considered himself entitled to assert, in a paper published in the Journal of the Society of Arts (May 25, 1877), and in Nature (May 31, 1877) that the normal French fork La_3 gives, not 870 single vibrations, as has been hitherto supposed, but 878 single vibrations. Mr. Ellis, having established the further fact that the forks constructed by me are in perfect accord with the French La$_3$, does not hesitate to affirm that all these forks, including those even of my large tonometer, which he has probably never examined, are necessarily inexact. Not having at my disposal the instrument used by Mr. Ellis, I confess that I find myself under some embarassment in stating at once by what error of construction this instrument, in the hands of Mr. Ellis, has given results so extraordinary. Fortunately, I can refer to a letter from M. Helmholtz addressed to Mr. Appunn and published by the latter himself in a paper on the acoustic theories of M. Helmholtz. This letter speaks of an instrument of exactly the same character, and made by the same maker, and sufficiently explains the surprising discoveries of Mr. Ellis. "I have examined your tonometer several times," writes M. Helmholtz to Mr. Appunn, "and I am astonished at the constancy of its indications. I would not have believed that reeds could give sounds so constant as those given by your apparatus, thanks to your method of regulating the current of air. The instrument, it is true, varies a little with the temperature, as do also forks; and hence it can be used for determining the absolute number of vibrations, only when one can work in a room heated by a stove. By the aid of an astronomical chronometer, I have counted the beats, and believe that your seconds pendulum must have been slightly inexact, because, though the number of beats agree very well among themselves, the absolute number obtained is not 240 but 237 to the minute. The temperature, which was rather low during my experiments, may count for something; but even this influence may be eliminated by counting the beats to the end of a major-third, which took me a quarter of an hour. In this way I have found for my Paris fork 435.01 vibrations, which agrees to the $\frac{1}{40000}$ nearly with the official number, 435 vibrations."

This letter proves that the entire number of beats in the octave of the tonometer tested by M. Helmholtz was $\frac{237}{60} \times 64 = 252.8$, and that its fundamental note was 505.6 single vibrations instead of 512. On comparing this note of 505.6 single vibrations with a fork giving actually 512 single vibrations, Mr. Ellis would find the latter to be 6.4 single vibrations more acute and, without doubt, would consider it as giving 518.4 single vibrations. Now for my forks giving 512 single vibrations, he has found 516.7 only, with the tonometer which he used. Whence it would seem that the fundamental note of this latter instrument had become more nearly exact than that of the tonometer examined by M. Helmholtz, since the number of its vibrations is 507.3. This note, however, still remains quite distant from its true value.

The fact that M. Helmholtz succeeded, with an instrument of this sort (and one too, even less perfect than that used by Mr. Ellis) in finding the number of vibrations of the official French fork to be exact, by first determining the correction needed for his instrument, is evidence that Mr. Ellis has neglected to determine a similar correction required for his tonometer. He has too hastily declared that these small tonometers with harmonium reeds are the most perfect and the most exact in existence. It would certainly have been much better if he had first given himself a little practice in the manipulation of acoustic instruments, before having treated so slightingly the results obtained by Lissajous, by Despretz, by Helmholtz, by Mayer, etc., etc., and before seeking to throw discredit upon the labors of a *constructeur* who had no reason to expect so unjustifiable an attack.

In addition to Helmholtz's evidence, Professor A. M. Mayer has furnished the following statement concerning the absolute number of vibrations of König's forks. "During the months of March, April and May of 1876, I made many determinations of the number of vibrations of König's UT_3 fork and found that it gave 255.96 complete vibrations in one second at a temperature of 60° Fahr. The following are the separate determinations of that series of which the above number is the mean: (1) 255.95, (2) 255.97, (3) 255.90, (4) 255.92, (5) 256.02, (6) 256.02. The forks vibratory period is accelerated or diminished $\frac{1}{22000}$ part by a difference of temperature of $\pm 1^\circ$ Fahr."

26 Rue de Pontoise, Paris, June 5th, 1877.

On a New Species of Adocidæ from the Tertiary of Georgia.

By E. D. Cope.

(*Read before the American Philosophical Society, July* 20, 1877.)

Professor George Little, State Geologist of Georgia, placed in my hands for determination a Chelonite from a Tertiary formation in Macon Co. of that State. The matrix is a rather soft limestone of a light drab color. When the specimen was first obtained it was nearly perfect, lacking only the posterior part of one side, and the posterior border of the carapace. Having been mutilated by destructive curiosity hunters, there remain now the plastron and the anterior half of the carapace, with a considerable portion of the posterior part of the left margin. The surface has been exposed to the weather so as to obscure, and in some places to obliterate the dermal sutures, while the skeletal sutures are distinct. The form has been slightly distorted by lateral pressure, but not much.

The obscurity of the dermal sutures renders the determination of the generic affinities somewhat difficult. The skeleton preserves the Emydoid type, not exhibiting intersternal bones, and having a well developed mesosternum. The vertebral bones extend to between the sixth pair of costals, beyond which the specimen is imperfect in that region. The costal capitula are well developed, but whether they reach the vertebral centra, the specimen does not permit me to discover. The plastron is of peculiar form, the lobes being short and contracted. The anterior is rounded from a base of usual width, while the posterior, from a similar base, narrows rapidly to a point, as in the genus *Aromochelys*.

An important point is observed in the direction of the abdomino-pectoral